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Maintenance Manual

DECEMBER 1970

MODEL RS 725

RESISTANCE STANDARD

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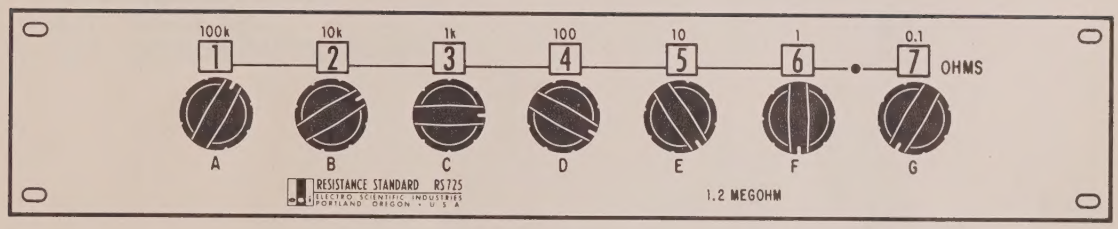

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Electro Scientific Industries

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KELVIN KLAMPS® Four-Terminal Clamps
KELVIN KLIPS® Four-Terminal Clips
PORTAMETRIC® Portable Measuring Instrument
PVB® Potentiometric Voltmeter Bridge

SECTION I
INTRODUCTION

1.1 DESCRIPTION

The Model RS 725 Resistance Standard is a seven decade standard with a resistance range of 0.1 Ω through 1.2 MΩ, 0.1 Ω steps (12 MΩ, 1 Ω steps optional).

1.2 SPECIFICATIONS

Resistance Range: 1.2 MΩ, 0.1 Ω steps (Optional, 12 MΩ, 1 Ω steps).

Zero Resistance: 10 mΩ maximum.

Initial Accuracy: ±(50 ppm + 2 mΩ).

Long Term Accuracy: ±(100 ppm + 4 mΩ).

Calibration Conditions: Four-terminal measurement at 23°C ±1°C; R H 30% to 70%.

Temperature Coefficient:	100 Ω/step and higher	±5 ppm/°C
	10 Ω/step	±15 ppm/°C
	1 Ω/step and lower	±20 ppm/°C
	Wiring and switches	±50 μΩ/°C
Power Coefficient of Resistance:	100 Ω/step and higher	±0.2 ppm/mW/step
	10 Ω/step	±0.3 ppm/mW/step
	1 Ω/step	±0.4 ppm/mW/step
	0.1 Ω/step	50 μΩ/W total

Power Rating: 1.0 W/step or 5.0 W total (maximum 200 V/step).

Breakdown Voltage: 1000 V peak to case.

Leakage: 10^{11} Ω.

Dimensions: Height 3.5 in. (8.9 cm), Width 19 in. (48.25 cm), Depth 12 in. (30.5 cm).

SECTION II

CONTROLS AND TERMINALS

2.1 FRONT PANEL CONTROLS

Model RS 725 controls and indicators are shown in Figure 2-1.

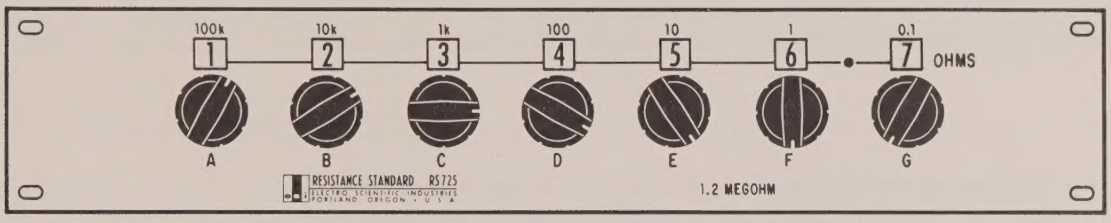


Figure 2-1. Model RS 725 Controls and Indicators

Seven decade dials labeled A through G, with indicator windows, select and indicate the standard resistance in ohms.

2.2 REAR PANEL CONNECTORS

Rear panel terminals of the Model RS 725 are shown in Figure 2-2.

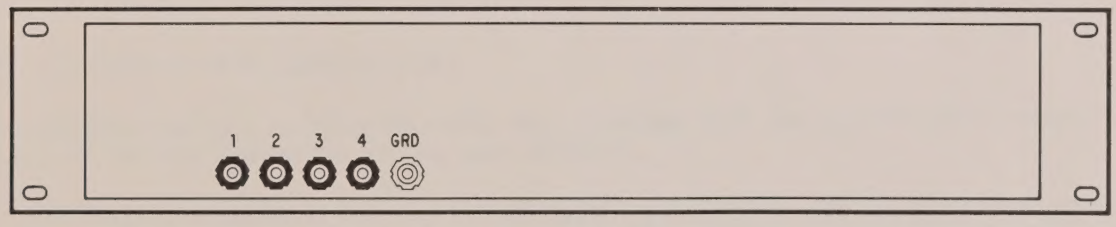


Figure 2-2. Rear Panel Terminals

Terminals 1, 2, 3, 4 and GRD connect to the bridge.

SECTION III

PERIODIC MAINTENANCE

The following procedures should be performed approximately once a year to insure maximum accuracy and reliability from the Model RS 725 Resistance Standard. If problems can be isolated to individual parts, the defective part should be returned to the factory for repair or replacement. If the need for major repairs is apparent, it is recommended that the unit be sent to the factory for service. The service department will be happy to furnish the necessary information for repairs and replacement parts. Unauthorized repairs, however, will invalidate the instrument warranty.

3.1 ACCESSING COMPONENTS

Prepare a soft, clean place to set the instrument. Be sure that no projections or pointed objects will be underneath it. See that there are no metal filings in the area.

To remove the instrument from the cabinet, disconnect all connectors, remove the four mounting screws on the front panel and pull the unit straight back out of the cabinet. Place on the prepared surface.

To remove the top or bottom cover, remove the six screws on that cover and lift it off.

3.2 VISUAL INSPECTION

Inspect the outside of the unit for dial orientation and damage to connectors, binding posts and binding post caps. Check for dirt around binding post insulators. Inspect the interior for loose or broken connections, damaged or dirty switch or socket contacts, heat-damaged resistors, and resistors touching each other or the grounded switch structure.

3.3 CLEANING AND LUBRICATION

Clean the front and rear panels with a soft, dry, lint-free cloth, being particularly careful to remove all dirt from around the binding post insulators.

The only internal components that may require cleaning and lubrication are the rotary switches. Carefully lubricated at the time of manufacture and protected from contamination by the instrument case, they should rarely, if ever, require maintenance. It is recommended that they be cleaned and lubricated *only* if they are not making good electrical contact. In such a case proceed as follows:

1. Place instrument horizontally on bench, with a sheet of white paper under switch to be cleaned. Spray switch with Freon TF degreaser in aerosol can (Miller Stephenson Co. or equivalent) until no more residue appears on white paper. Drying is not necessary.

2. Lubricate with a low-conductivity oil (Viscosity Oil Co., No. 7069, available from ESI as Part No. 13500). Apply one drop to each rotor tab and one drop to the rotor ring contact using a hypodermic needle. With a small brush, apply a dab of petroleum jelly to each switch bearing and detent mechanism. DO NOT OVERLUBRICATE.

3.4 REPLACING THE COVERS

Be sure that the interior of the case is completely clear of all foreign material. Slip the covers over the unit and replace the screws.

3.5 ELECTRICAL TEST

Equipment Required: Ohmmeter (Simpson Model 260 or equivalent).

1. Connect one lead of the ohmmeter to either terminal 1 or 2 on the rear of the Model RS 725. Connect the other lead to terminal 3 or 4.

2. Set Model RS 725 dials to minimum setting: 0 0 0 0 0 0 1.

3. Zero the ohmmeter.

4 Verify that each step of each dial increases the ohmmeter reading by the following amounts:

	STANDARD UNIT	OPTIONAL UNIT
First dial	100 kΩ/step	1 MΩ/step
Second dial	10 kΩ/step	100 kΩ/step
Third dial	1 kΩ/step	10 kΩ/step
Fourth dial	100 Ω/step	1 kΩ/step
Fifth dial	10 Ω/step	100 Ω/step
Sixth dial	1 Ω/step*	10 Ω/step
Seventh dial	0.1 Ω/step*	1 Ω/step

*A more sensitive measuring instrument may be necessary to check this dial, depending on accuracy desired.

SECTION IV

REPLACEMENT PARTS

4.1 PARTS LIST

The following parts are listed alphabetically by description. All parts are available from Electro Scientific Industries, Inc.

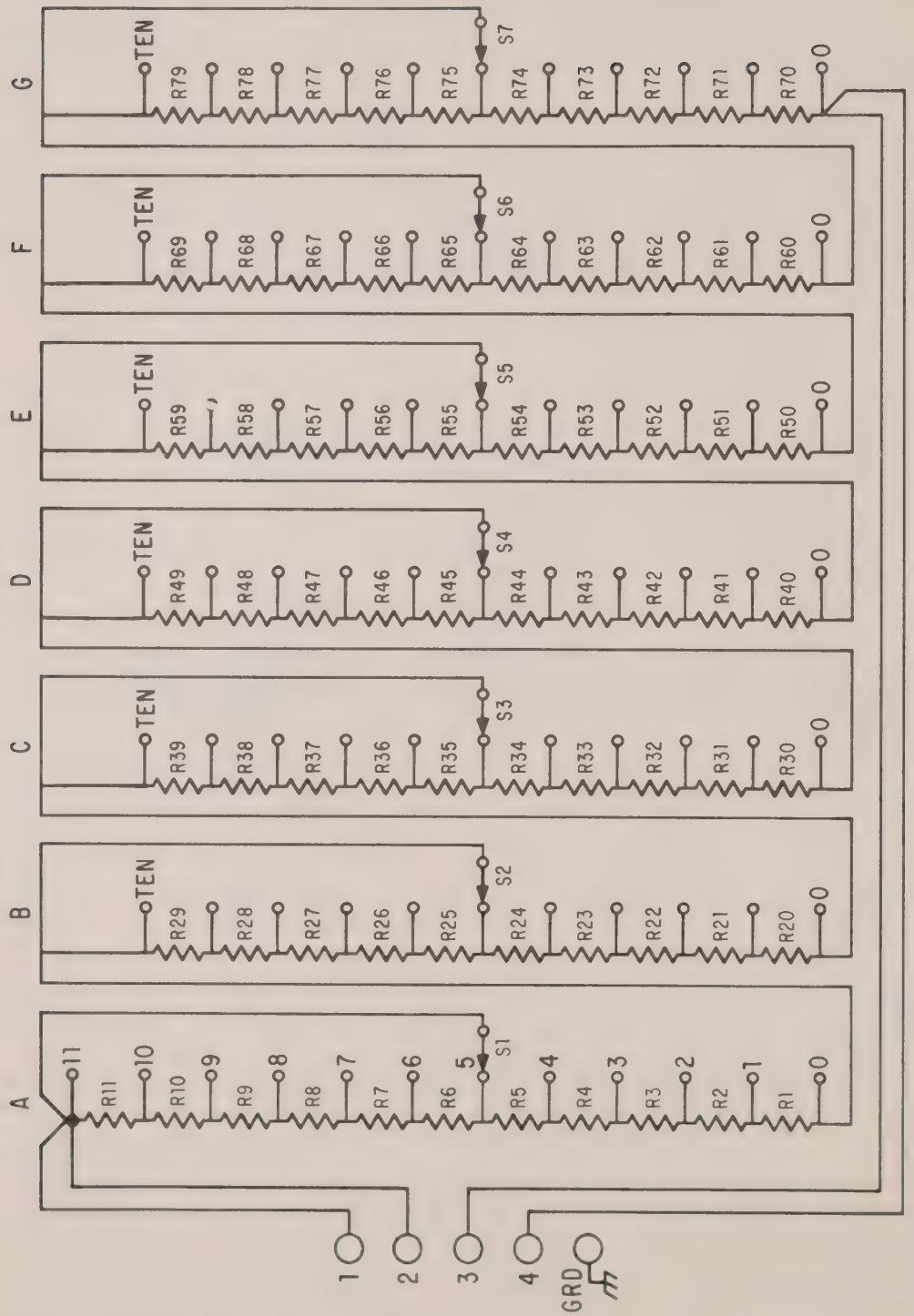
The Federal Supply Code for Manufacturers (FSCM) for Electro Scientific Industries is 11837.

When ordering parts, please include the following information:

Model and serial number of the instrument
ESI part number
Description of part

DESCRIPTION	PART NO.	QTY USED
Cap, Binding Post, Gray	1476	4
Cap, Binding Post, Gold	1172	1

Due to the requirement for critical adjustment of high-precision resistors *after* replacement, the Model RS 725 is considered non-repairable in the field. Any unauthorized field repair will void the warranty of the unit.



DECADE	A (S1)	B (S2)	C (S3)	D (S4)	E (S5)	F (S6)	G (S7)
1.2 MEGOHM UNIT VALUE PER STEP	100kΩ	10kΩ	1kΩ	100Ω	10Ω	1Ω	0.1Ω
12 MEGOHM UNIT VALUE PER STEP	1MΩ	100kΩ	10kΩ	1kΩ	100Ω	10Ω	1Ω

Figure 4-1. Model RS 725 Schematic Diagram

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1. Two years for components and instruments utilizing passive circuitry. One year on repairs of out-of-warranty items.
2. One year on components and instruments utilizing active circuitry as identified in the price list. Six months on repair of out-of-warranty items.

During the in-warranty periods, we will service or, at our option, replace any device that fails in normal use to meet its published specifications. Batteries, tubes and relays that have given normal service are excepted. Special systems will have warranty periods as listed in their quotation.

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Would you like more information?

ESI technical publications are listed on the back of this page. If you would like any of these, simply check the appropriate box and fill in your address below. Also, please add any comments you have concerning the instrument or instruction manual. We value your feedback to help us improve or correct our manuals.

Instrument Description: Model No. _____ Serial No. _____
(Please Print)

Name _____ Title _____

Department _____ Mail Stop _____

Company _____

Address _____

City _____ State _____ Zip Code _____

Comments or corrections _____

_____

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☐ EB10 Effects of Output Loading on Resistive Voltage Dividers, *October 1969*

☐ EB15 Low Input Resistance Voltage Dividers, *February 1970*

☐ EB17 Accuracy vs. Frequency of Models 290B and 250DE Universal Impedance Bridges, *(revised May 1969)*

☐ EB26 International System of Units, *August 1969*

☐ EB29 DC and Low Frequency AC Ratio Measurements, *Dr. Merle L. Morgan, September 1962*

☐ EB30 Traceability of Resistance Measurement, *Jack Riley, January 1964*

☐ EB34 Resistance Transfer Technique, *Lawrence H. White, (revised April 1968)*

☐ EB35 An Improved Technique for Establishing Resistance Ratios, *R. M. Pailthorp and J. C. Riley, November 1962*

☐ EB41 Derivation of Electrical Units from Fundamental Standards, *R. D. Kuykendall and R. M. Pailthorp, July 1964*

☐ EB44 DC measurements Using Ratio Techniques, *Jack C. Riley, September 1965*

☐ TA2 A Ratio Transformer Bridge for Standardization of Inductors and Capacitors, *D. L. Hillhouse and H. W. Kline, August 1960*

☐ TA6 The Accuracy of Series and Parallel Connections of Four-Terminal Resistors, *Jack C. Riley, April 1965*

☐ TA8 AC Measurements Using Ratio Techniques, *Jack C. Riley, May 1965*

☐ TA14 The Advantages of a Ten Kilohm Transportable Resistance Standard, *Robert M. Pailthorp, September 1967*

☐ TA16 Which Bridge for Precise Resistance Measurements? *Edward J. Swenson and George D. Vincent, December 1967*

☐ TA17 Experimental Verification of the Five-Terminal, Ten-Kilohm Resistor as a Device for Dissemination of the Ohm, *R. M. Pailthorp and George Vincent, December 1968*

☐ TA22A Laser Resistance Trimming from the Measurement Point of View, *Arthur G. Albin and Edward J. Swenson, June 1971*

☐ TA23 Precision Measurement of Resistor Networks, *Robert M. Pailthorp and Jack C. Riley, June 1971*

☐ TA24 Predictive Adjustment of Tantalum Film Resistors by Anodization, *Donald R. Cutler and Edward J. Swenson, July 1971*

☐ TA25 Laser Trimming Analysis Using a Resistive Sheet Analogy, *Swenson, Vincent, Riley December 1972*

☐ TA26 The Effects of Laser Trimming on Birox and 1100 Series Thick Film Composition, *N. S. Spann, R. Headley, G. D. Vincent and E. J. Swenson, October 1971*

☐ TA27 Laser Trimming Thin Film Precision Resistor Networks with an Automated System, *Leonhard Groth, January 1974*

☐ TA28 YAG Laser Trimming of Thick Film Resistors, *Headley, Popowich, Anders, January 1974*

☐ TA31 A Method of Obtaining Optimum Trimming Performance from a Laser System, *Paul F. Parks and Thomas W. Richardson, October 1974*

☐ TA32 Laser Trimming RC Active Filters, *Edward J. Swenson, April 1978*

☐ TA33 Reducing Post Trim Drift of Thin Film Resistors By Optimizing YAG Laser Output Characteristics, *June 1978*

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